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BUREAU OF SHIPS GROUP  
TECHNICAL INSPECTION REPORT

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36745

Classification (Approved) (Changed to \_\_\_\_\_)  
By Authority of Joint Chiefs of Staff (Action 15 Apr 49)  
By General Order Dated Date 24 Apr 81

16 OPERATION CROSSROADS.

U.S. PENNSYLVANIA (CBB 38).

TEST BAKER [u]. 8

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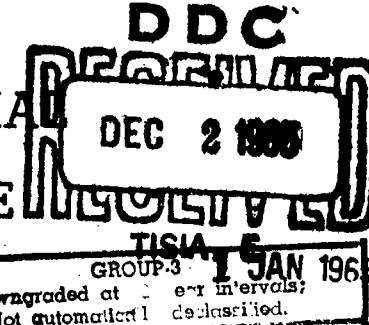
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OPERATION CROSSROADS

DIRECTOR OF SHIP MATERIALS

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JOINT TASK FORCE ONE



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TECHNICAL INSPECTION REPORT

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By Authority of Joint Chiefs of Staff (Action 15 Apr. 49).  
By J. H. D. (Dedict) Date 2-4-55

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APPROVED:

F.X. Forest,  
Captain, U.S.N.

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USS PENNSYLVANIA (BB38)

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1 JAN 1965  
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USS PENNSYLVANIA (BB38)

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U.S.S. PENNSYLVANIA (BB 38)

SHIP CHARACTERISTICS

Building Yard: Newport News Shipbuilding Co.

Commissioned: 12 June 1916.

HULL

Length Overall: 612 feet 3 inches.

Length on Waterline: 600 feet 0 inches.

Beam (extreme): 106 feet 3 inches.

Depth (molded at side, to main deck, amidships):  
45 feet 1 inch.

Drafts at time of test: Fwd. 30 feet 0 inches.  
Aft. 32 feet 3 inches.

Standard displacement: 33,100 tons.

Displacement at time of test: 37,110 tons.

MAIN PROPULSION PLANT

Main Engines: Westinghouse-Curtis turbines. Main high pressure ahead, and cruising, (starboard inboard).

Main high pressure ahead, and cruising. (port inboard).

Main low pressure ahead and astern, and H.P. astern (starboard outboard).

Main low pressure ahead and astern, and H.P. astern (port outboard).

Boilers: Five installed, type: White Forster express type, Mfg. by Babcock and Wilcox. One installed, type: Bu. of Eng'g. express, mfg. by Norfolk Navy Yard.

Main Condensers: Two installed in ship. 14000 sq. ft. cooling surface. Mfg. by Newport News S.B. and D.D.Co.

Reduction Gears: Single reduction, Mfg'd by Westinghouse Electric and Mfg. Co. One installed on each on H.P. ahead turbines and cruising turbines.

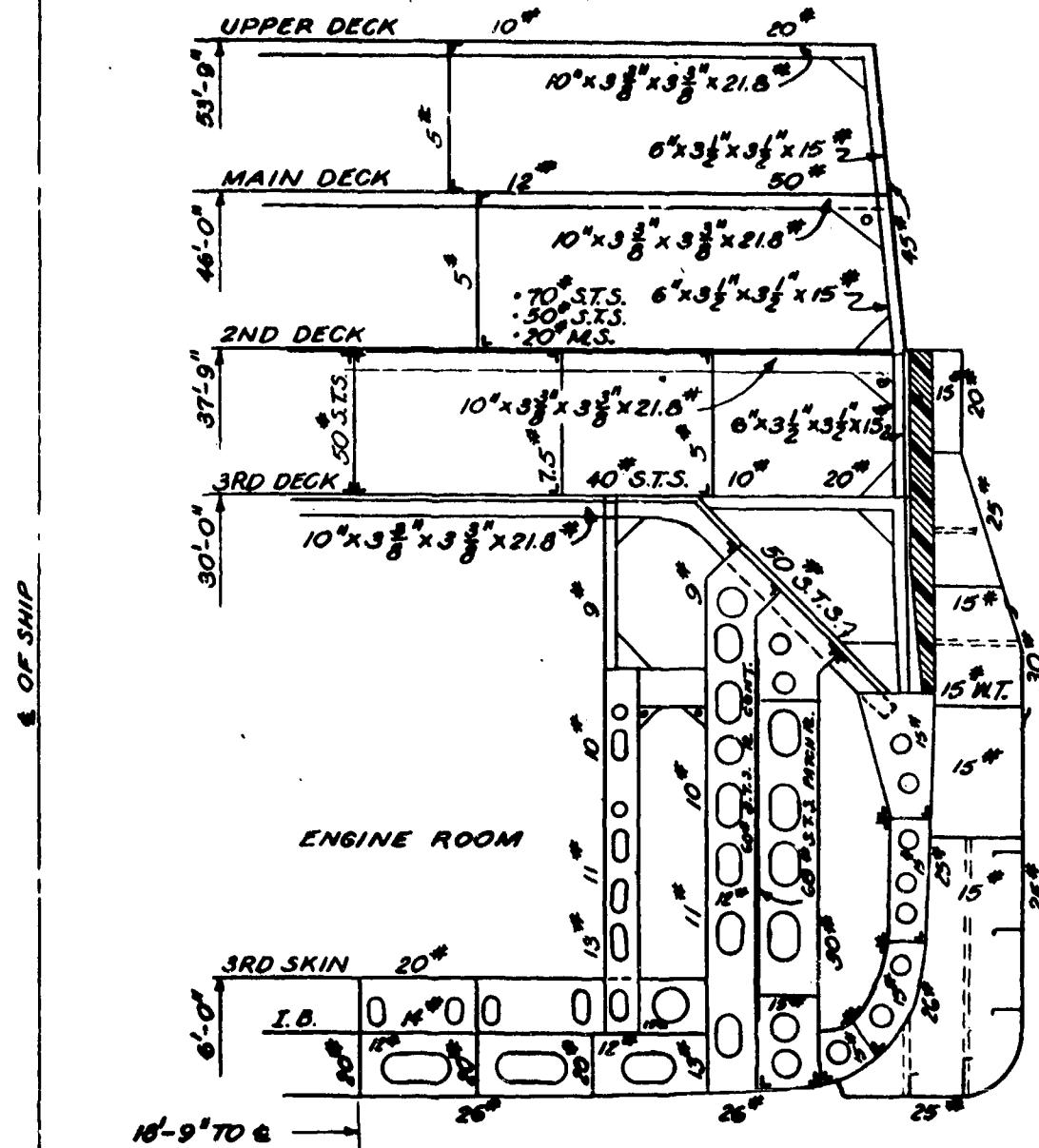
Propellers: Four installed in ship, 3 blades.

Main Shafting: Four installed in ship. Line shaft O.D.= 12 1/4", I.D.= 7 1/2".

Turbo Generators: Four installed in ship, Mfg'd. by Westinghouse Electric Co. 400 KW.

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*FRAMES 84 TO 103*  
**MIDSHIP SECTION**  
**TEST - B**

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**USS PENNSYLVANIA (BB 38)**

9380-B

## TECHNICAL INSPECTION REPORT

### OVERALL SUMMARY

#### I. Target Condition After Test.

##### (a) Drafts after test, general areas of flooding, sources.

	Forward	Aft	List
Before test drafts	30' 0"	32' 0"	0°
After Test drafts	27' 9"	36' 0"	1/2° Starboard

Seams in the previous torpedo damage area have been opened by the underwater shock wave. Leaks have also developed in the rudder stock gland and the stern tubes. Former slow leaks in bulkheads and decks immediately forward of the torpedo damage area have been reopened, apparently by the shock wave.

##### (b) Structural damage.

#### HULL

Hull damage occurs primarily on the starboard side aft in the area of previous torpedo damage and consists of opened seams.

#### MACHINERY

No comment.

#### ELECTRICAL

Minor damage to already damaged and weakened structure in vicinity of 1945 torpedo damage, had little or no effect on electrical equipment except for flooding.

##### (c) Other damage.

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## HULL

Not observed.

## MACHINERY

The casings of all boilers except #5, and brickwork of boiler No. 1, are moderately damaged. The ice machine room is filled with freon gas, indicating breakage of piping and possibly other damage to the refrigeration equipment. A few heavy machinery components apparently moved slightly on their foundations, but not enough to cause any damage. There is a small amount of minor damage to gages, etc.

NOTE: Very little machinery on this vessel was operated after Test B.

## ELECTRICAL

Damage to electrical machinery and electrical elements of ship control, fire control and gunnery as a direct result of the bomb was apparently negligible.

A small amount of mercury was spilled from the forward master gyro compass and several selectors, connectors and dust shields were dislodged on the automatic telephone exchange switchboard.

## II. Forces evidenced and effects noted.

### (a) Heat.

## HULL

There is no evidence of heat.

## MACHINERY

No evidence.

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## ELECTRICAL

None evidenced.

### (b) Fires and Explosions.

## HULL

None.

## MACHINERY

No evidence.

## ELECTRICAL

None evidenced.

### (c) Shock.

## HULL

There is light shock damage to topside radar equipment and to foundations in the general workshop on the third deck. The foundation of the cruising turbine in the No. 1 engine-room has worked a slight amount.

## MACHINERY

The PENNSYLVANIA received a fairly heavy underwater shock. Evidences include: cracks in brickwork in #1 boiler; disturbance of dust and paint around foundation of boilers 2 and 5 and main turbine foundations; breakage of freon lines in ice machine room; disarrangement of a few gages; breakage of one holding down bolt on the milling machine in the machine shop.

## ELECTRICAL

There was some evidence of shock throughout the vessel. However, except for minor damage to master gyro co. pass, automatic telephone switchboard and a few marine globes

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broken, electrical equipment was unaffected.

(d) Pressure.

HULL

The only indication of pressure is the damage to the boiler casings. All except No. 5 boiler casing are bulged. The maximum bulge is four inches.

MACHINERY

Blast pressure apparently caused the damage to the casings of boilers 1,2,3,4 and 6.

ELECTRICAL

This vessel was subjected to a pressure wave sufficient to cause further bulging of boiler casings and minor damage to a few radar antennas. However, there was no damage to any of the electrical equipment that could be detected from close visual examination.

(e) Effects peculiar to the Atomic Bomb.

HULL

The only effects peculiar to the Atomic Bomb are the long ranges of air blast and underwater shock waves and the presence of radioactivity.

MACHINERY

Blast pressure and shock sufficient to cause damage at this range from an explosion are apparently peculiar to the Atom Bomb.

ELECTRICAL

Radioactivity and wave phenomena.

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III. Results of Test on Target.

(a) Effect on machinery, electrical, and ship control.

HULL

None.

MACHINERY

Boilers 1,2,3,4 and 6 could have continued steaming but their maximum steaming rates would have been reduced until repairs were made to their casings. It is estimated that this could have been done by the ship's force within a few hours without securing any boiler. Boiler #5 was not affected. The refrigeration equipment is inoperable. The extent of damage to it was not determined, but it is not believed to be heavy.

ELECTRICAL

The overall effect on the electrical installation was negligible. The main electrical plant, switchboards, distribution panels, boiler and engine room motor driven auxiliaries were undamaged and apparently operable.

Ship control was affected to the extent of the minor damage to master gyro compass and secondary damage to the electric steering gear due to flooding of compartment D-421- Port and D-421 starboard. This flooding was due to failure of temporary patch over torpedo damage which occurred in 1945 which time this equipment was rendered inoperable.

(b) Effect on gunnery and fire control.

HULL

The secondary battery MK 37 directors are unable to train, having been damaged by shock. Topside firecontrol radar has also been mildly damaged by shock.

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## MACHINERY

No comment.

## ELECTRICAL

The electrical elements associated with gunnery and fire control were impaired to the extent of the minor damage to master gyro compass which had sufficient loss of mercury to introduce an error into the fire control input.

The power panels on electric deck in turret I and III, training motor in 40mm mount number 7 and elevating motor in 40mm mount number 2 received secondary damage from flooding, which was apparently due to decontamination efforts, while washing down with salt water.

### (c) Effect on watertight integrity and stability.

## HULL

Leaks have developed at the torpedo damage patch, the rudder stock gland, and the port inboard stern tube. Shock has apparently reopened former leaks in decks and bulkheads in the area just forward of the torpedo patch and this permitted progressive flooding.

Stability is negligibly affected.

## MACHINERY

No comment.

## ELECTRICAL

Electrical damage had no adverse effects on water-tight integrity and stability.

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(d) Effect on personnel and habitability.

HULL

Personnel casualties would have been light.

Habitability is impaired only by the flooding in the after spaces and by radioactivity.

MACHINERY

There would probably have been some casualties among fireroom personnel if the ship had been steaming. It is not believed that there would have been any other personnel casualties below decks except for effects of radioactivity. Habitability was affected by inoperability of the refrigeration equipment and by radioactivity, which was high when the ship was inspected 25 days after Test B.

ELECTRICAL

Other than the effects of radioactivity it is estimated that casualties on topside would have been limited to minor bruises. Personnel below decks would be relatively secure except in firerooms where possible flareback and accumulation of combustion gases would render all operating personnel casualties, at least temporarily.

Habitability has not been impaired as a result of any electrical damage.

(e) Effect on fighting efficiency.

HULL

The fighting efficiency is impaired by the shock damage to the topside fire control radar equipment and the secondary battery MK 37 directors.

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## MACHINERY

The ship's maximum speed would have been reduced to about 15 knots but could have been gradually restored to normal as the ship's force effected repairs. The test had no other effect on fighting efficiency, as far as machinery is concerned.

## ELECTRICAL

The fighting efficiency of this vessel has been somewhat reduced due to minor damage to master gyro compass which had sufficient loss of mercury to introduce an error to the inputs of radar and fire control equipment.

## IV. General Summary of Observers' Impression and Conclusions.

### HULL

The flooding aft is not of an important nature.

A ship of this class, if manned and in normal repair, would not suffer significant structural damage from an attack of this magnitude at her distance from the burst.

## MACHINERY

The PENNSYLVANIA was outside the range of heavy mechanical damage from the explosion of Test B, but the effects of radioactivity on her would probably have been serious.

## ELECTRICAL

This vessel was subjected to an underwater shock wave of sufficient intensity to cause minor damage to master gyro compass and automatic telephone exchange switchboard. There was no other electrical damage except for flooding of electric steering gear room (which could have been controlled had a crew been on board) and a broken dome door glass on the starboard 36 inch searchlight which was apparently struck by a fragment.

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V. Preliminary General or Specific Recommendations of Inspection Group.

HULL

Adequate shock mounts should be provided for Mark 37 directors and topside radar equipment.

The problem of preventing or reducing air pressure damage to boiler casings is worthy of a thorough investigation.

MACHINERY

Boiler casings should be strengthened.

ELECTRICAL

None.

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# TECHNICAL INSPECTION REPORT

## SECTION I - HULL

### GENERAL SUMMARY OF HULL DAMAGE

#### I. Target Condition After Test.

(a) Drafts after test; list; general areas of flooding, sources.

	Forward	Aft	List
Before test drafts	30'-0"	32'-0"	0°
After test drafts	27'-9"	36'-0"	1/2° starboard

Seams in the previous torpedo damage area have been opened by the underwater shock wave. Leaks have also developed in the rudder stock gland and the stern tubes. Former slow leaks in bulkheads and decks immediately forward of the torpedo damage area have been re-opened apparently by the shock wave.

(b) Structural damage.

Hull damage occurs primarily on the starboard side aft in the area of previous torpedo damage and consists of opened seams.

(c) Other damage.

Not observed.

#### II. Forces Evidenced and Effects Noted.

(a) Heat.

There is no evidence of heat.

(b) Fires and explosions.

None.

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USS PENNSYLVANIA (BB38)

(c) Shock.

There is light shock damage to topside radar equipment and to foundations in the general workshop on the third deck. The foundation of the driving turbine in the No. 1 engineroom has worked a slight amount.

(d) Pressure.

The only indication of pressure is the damage to the boiler casings. All except No. 5 boiler casing are bulged. The maximum bulge is four inches.

(e) Effects apparently peculiar to the atom bomb.

The only effects peculiar to the atom bomb are the long ranges of air blast and underwater shock waves and the presence of radioactivity.

III. Effects of Damage.

(a) Effect on machinery, electrical and ship control.

None.

(b) Effect on gunnery and fire control.

The secondary battery Mk 37 directors are unable to train, having been damaged by shock. Topside fire-control radar has also been mildly damaged by shock.

(c) Effect on water-tight integrity and stability.

Leaks have developed at the torpedo damage patch, the rudder stock gland, and the port inboard stern tube. Shock has apparently reopened former leaks in decks and bulkheads in the area just forward of the torpedo patch and this permitted progressive flooding.

Stability is negligibly affected.

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(d) Effect on personnel and habitability.

Personnel casualties would have been light. Habitability is impaired only by the flooding in the after spaces and by radioactivity.

(e) Effect on fighting efficiency.

The fighting efficiency is impaired by the shock damage to the topside fire control radar equipment and the secondary battery Mk 37 directors.

IV. General Summary of Observers' Impressions and Conclusions.

The flooding aft is not of an important nature.

A ship of this class, if manned and in normal repair, would not suffer significant structural damage from an attack of this magnitude at her distance from the burst.

V. Preliminary General or Specific Recommendations of Inspection Group.

Adequate shock mounts should be provided for Mk 37 directors and topside radar equipment.

The problem of preventing or reducing air pressure damage to boiler casings is worthy of a thorough investigation.

VI. Instructions for loading the vessel specified the following:

ITEM	LOADING
Fuel Oil	50%
Diesel Oil	50%
Ammunition	50%
Potable and reserve feed water	Full Load
Salt water ballast	1630 Tons
Gasoline	50%

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Details of the actual quantities of the various items aboard are included in Report 7, Stability Inspection Report, submitted by the Ship's Force in accordance with "Instructions to Target Vessels for Tests and Observations by Ship's Force" issued by the Director of Ships Material. This report is available for inspection in the Bureau of Ships Crossroads Files.

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## DETAILED DESCRIPTION OF HULL DAMAGE

### A. General Description of Hull Damage.

#### (a) Overall condition of vessel.

The underwater shock wave has caused flooding in the spaces aft, mostly through opened seams in the torpedo damage patch. There is a considerable amount of slow progressive flooding that would not have occurred had the ship been manned.

There is mild shock damage throughout the ship.

#### (b) General areas of hull damage.

Hull damage is primarily on the starboard side, aft in the area of previous torpedo damage.

#### (c) Apparent causes of hull damage in each area.

Leakage is the result of the underwater shock wave.

#### (d) Principal areas of flooding with sources.

There is flooding in the after part of the ship. The principal sources are opened seams in the torpedo damage patch, the rudder stock gland, and the stern tubes.

#### (e) Residual strength, buoyancy, and effect of general condition of hull on operability.

The longitudinal strength of the ship is unimpaired. If the ship had been manned the amount of buoyancy lost would have been negligible.

Operability is unaffected.

### B. Superstructure.

No damage.

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C. Turrets, Guns and Directors.

(a) Protected Mounts.

1. General condition including operability, if known.

Test R had little effect on the turrets. There is evidence that turret 3 lifted and drew up on the holding down clips but no damage resulted. The lower handling room of turret 4 flooded. (See Item L). This would have caused this turret to become inoperable. This casualty must be partially discounted since flooding originated around seams of a temporary patch in the stern which is not representative of normal hull construction and since no personnel were on-board to take corrective action. The turrets were not damaged nor was operability otherwise affected.

2. Effectiveness of installed turrets or shields.

Satisfactory.

(b) Unprotected Mounts.

1. General condition, including operability, if known.

No damage. Operability is not affected.

2. Effectiveness and sufficiency of crew shelters.

Satisfactory.

(c) Directors and range-finders (14" turrets).

1. General condition, including operability, if known.

A periscope in turret 1, was dislodged from the bulk-head bracket stowage by shock. Otherwise equipment is not damaged and operability is unaffected.

2. Condition of instruments therein.

No damage.

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(d) Constructive criticism of design or construction of mounts, directors, foundations and shelters.

No comment.

D. Torpedo Mounts, Depth Charge Gear.

Not applicable.

E. Weather Deck.

No damage. The locations and recordings of scratch gages installed to measure movement of the weather deck are tabulated on page 62 and 63.

F. Exterior Hull (above w.l.).

No damage.

G. Interior Compartments (above w.l.).

(a) Damage to structure and cause.

There is no structural damage.

(b) Damage to joiner bulkheads and cases.

There is no damage to joiner bulkhead.

(c) Details of damage to access closures and fittings.

There is no damage to access closure or fittings.

(d) Condition of equipment within compartments.

There is some shock damage to equipment in the second deck between frames 90 and 113. Curtains are off hangars. Dishes are broken in the wardroom pantry. Emergency handy-billy hoses bounced from the rack at frame 90, and steam tight light bulbs are broken.

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On the third deck, there is shock damage in the general workshop, C-505, between bulkheads 91 and 100, centerline. Three foundation bolts have been broken on the milling machine and it has moved to starboard. The foundation bolts in the boring mill are loose.

H. Armor Decks and Miscellaneous Armor.

No damage.

I. Interior Compartments (below w.l.).

(a) Damage to structure and causes.

There is no structural damage.

(b) Damage to joiner bulkheads and causes.

There is no damage to joiner bulkheads.

(c) Details of damage to access closures and causes.

Several water-tight doors in the first platform, aft, have been loosened and rendered non-tight. See Item L.

(d) Condition of equipment within compartments.

The foundation of the cruising turbine in Number 1 engine room has worked as evidenced by cracked paint.

All boilers are mildly damaged. Damage has been caused by both blast and shock.

(e) Flooding.

See Item L.

(f) Damage in way of piping, cables, ventilation ducts, shafts, etc.

A branch of the firemain in the Number 2 boiler room has a slight leak at the sweated joint directly above the floor plate.

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(g) Estimate of reduction in watertight subdivision, habitability, and utility of spaces.

Flooding would normally have been limited to the steering gear compartment (d-422) and the shaft alley (d-102). Utility of the spaces would be unimpaired. Habitability would be impaired only by the flooding.

J. Underwater Hull.

(a) The interior inspection of the hull indicates that opening of seams in the torpedo damage hatch is probable. There is also leakage through the rudder post gland and the port inboard stern tube.

(b) Effect of damage on buoyancy, operability, maneuverability.

Operability and maneuverability are unaffected. If the ship had been manned, flooding would have been limited to D-422 and the shaft alley. The effect of this on buoyancy would be very slight.

(c) Any known or suspected damage to shafts, propellers, struts, rudders, or external keels.

(d) Details of impairment of keel structure.

There is no known or suspected damage to keel structure.

K. Tanks.

(a) Condition of tanks in areas of damage.

Tanks D-7-W, and D-7-V-LB, are completely flooded.

(b) Contamination of liquids.

There has been no contamination of liquids.

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(c) Damage (known or suspected) to torpedo defense systems.

There is no damage known or suspected to the torpedo defense system.

L. Flooding.

(a & b) Description of major flooding areas and sources.

There is some flooding in the stern. A sketch showing the flooded spaces is on page

Leakage through the port inboard stern tube has completely flooded the shaft alley, D-102 and partially flooded the shaft alley trunk. There is also seepage in the bilges of Numbers 3 and 4 engine rooms from the shaft alley.

The following have flooded completely from opened seams in the torpedo patch: D-7-W, D-7-V-LB, D-9-V-LB, D-105, D-106, D-421-S and D-425.

The steering gear room, D-422 has flooded completely through the rudder post gland. The steering room, D-421-P has partially flooded from D-422 through the steering shaft gland, and from D-421-3 through a damaged water-tight doors. The after peak, D-106, has flooded from D-422 through leaks in the first platform.

The H.P. Air Compressor Room, D-311 has flooded completely, from D-7-W and D-105. Ordnance stores, D-306 has flooded from D-311 through leaky bulkhead fittings.

D-303-M and D-303-1 have flooded from D-306 through fittings in bulkhead 115. Captains stores, D-307 and dry provision stores, D-308 have also flooded from D-306 through damaged watertight doors.

D-419-2 has flooded completely from D-421-S through steering shaft bulkhead glands. D-417-D-418-1, D-419, D-419-1 and D-507 have partially flooded from D-419-2.

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D-401-B, and D-407-T have acquired 6 inches of water from the decontamination wetting down.

(c) List of compartments believed to have flooded slowly so as to be susceptible to damage control.

All spaces except those directly flooded through patch seams are subject to damage control. Other flooding could have been limited to the steering gear compartment, DD-422 and the Shaft Alley D-102.

M. Ventilation (exclusive of blowers).

No damage.

N. Ship Control.

No damage.

O. Fire Control.

(a) Damage to fire control stations and causes.

1. Directors and elevated control positions.

The secondary battery Mk. 37 directors were seriously affected by shock. The holding down clip bracket which houses the train locking pin was jarred loose and jammed the locking pin. This prevents training of the directors. The starboard director showed a horizontal shift in a forward direction, causing bending of radial bearings at 090°, 120°, 150°, and 180°.

2. Plot rooms and protected spaces.

No damage.

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(b) List of stations having insufficient protection and estimated effect on fighting efficiency of the loss of each.

Secondary battery directors and topside radar equipment are insufficiently protected from shock damage. The fighting efficiency of the ship would have been considerably reduced from the loss of these directors and the fire control radar equipment.

(c) Constructive criticism of location and arrangement of stations.

No comment.

P. Ammunition Behavior.

(a) Ready service ammunition, location, protection, behavior under heat and blast.

Satisfactory. One bag of test powder was knocked from the tray on the lower 14" / 45 hoist to the deck of the handling room from shock.

(b) Magazines, location, protection, forces involved, behavior.

Satisfactory.

(c) List of stowages which are insufficiently protected and effects on ship survival of explosion of each stowage.

None.

(d) Behavior of gasoline stowage facilities.

No information available.

Q. Ammunition Handling.

(a) Condition and operability of ammunition handling devices.

No damage. Operability not affected.

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(b) Evidence that any ammunition handling device contributed to passing of heat, fire, blast or flooding water.

None.

(c) Constructive criticism of design and construction of ammunition handling devices.

No comment.

R. Strength.

(a) Permanent hog or sag.

There is no evidence of permanent hog or sag.

(b) Shear strains in hull plating.

There are no shear strains in the hull plating.

(c) Evidences of transverse or racking strain.

There is no evidence of any transverse or racking strains.

(d) Details of any local failures in way of structural discontinuities.

There are no local failures in way of structural discontinuities.

(e) Evidence of panel deflection under blast.

There is no evidence of panel deflection under blast.

(f) Turret, machinery, and gun foundations.

In the general workshop on the third deck between bulkheads 91 and 100, three foundation bolts are broken on the milling

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machine and it has moved to starboard. The foundation bolts of the boring mill are also loose.

The cruising turbine foundation in number 1 engine room has worked slightly as evidenced by cracked paint.

S. Miscellaneous.

No comment.

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## TECHNICAL INSPECTION REPORT

### SECTION II - MACHINERY

#### GENERAL SUMMARY OF MACHINERY DAMAGE

##### I. Target Condition After Test.

- (a) Drafts after test; list; general areas of flooding, sources.

No data taken by machinery group.

- (b) Structural damage.

No comment.

- (c) Other damage.

The casings of all boilers except #5, and brick-work of boiler No. 1, are moderately damaged. The ice machine room is filled with freon gas, indicating breakage of piping and possibly other damage to the refrigeration equipment. A few heavy machinery components apparently moved slightly on their foundations, but not enough to cause any damage. There is a small amount of minor damage to gages, etc.

Note: Very little machinery on this vessel was operated after Test B.

##### II. Forces Evidenced and Effects Note.

- (a) Heat.

No evidence.

- (b) Fires and explosions.

No evidence.

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(c) Shock.

The PENNSYLVANIA received a fairly heavy underwater shock. Evidences include: cracks in brickwork in #1 boiler; disturbance of dust and paint around foundation of boilers 2 and 5, and main turbine foundations; breakage of freon lines in ice machine room; disarrangement of a few gages; breakage of one holding down bolt on the milling machine in the machine shop.

(d) Pressure.

Blast pressure apparently caused the damage to the casings of boilers 1, 2, 3, 4 and 6.

(e) Any effects apparently peculiar to the atom bomb.

Blast pressure and shock sufficient to cause damage at this range from an explosion are apparently peculiar to the atom bomb.

III. Effects of Damage.

(a) Effect on machinery and ship control.

Boilers 1, 2, 3, 4, and 6 could have continued steaming but their maximum steaming rates would have been reduced until repairs were made to their casings. It is estimated that this could have been done by the ship's force within a few hours without securing any boiler. Boiler #5 was not affected. The refrigeration equipment is inoperable. The extent of damage to it was not determined, but is is not believed to be heavy.

(b) Effect on gunnery and fire control.

No comment.

(c) Effect on watertight integrity and stability.

No comment.

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(d) Effect on personnel and habitability.

There would probably have been some casualties among fireroom personnel if the ship had been steaming. It is not believed that there would have been any other personnel casualties below decks except for effects of radioactivity. Habitability was affected by inoperability of the refrigeration equipment and by radioactivity, which was high when the ship was inspected 25 days after Test B.

(e) Total effect on fighting efficiency.

The ship's maximum speed would have been reduced to about 15 knots but could have been gradually restored to normal as the ship's force effected repairs. The test had no other effect on fighting efficiency, as far as machinery is concerned.

IV. General Summary.

The PENNSYLVANIA was outside the range of heavy mechanical damage from the explosion of Test B, but the effects of radioactivity on her would probably have been serious.

V. Preliminary Recommendations.

Boiler casings should be strengthened.

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## DETAILED DESCRIPTION OF MACHINERY DAMAGE

### A. General Description of Machinery Damage.

#### (a) Overall condition.

The casings of all boilers Except #5, and the brick-work of boiler #1 were damaged. These boilers can still be steamed but at reduced maximum rate. It is estimated that temporary repairs could have been made without shutting down any boiler within a few hours. The refrigeration machinery is not accessible as the compartment is filled with freon gas, indicating considerable breakage of piping and possibly other damage. A few heavy machinery components apparently moved slightly on their foundations, but not enough to cause any damage. Very little machinery on this vessel was operated after Test B.

#### (b) Areas of major damage.

None.

#### (c) Primary causes of damage.

Shock and blast pressure caused all damage found to machinery.

#### (d) Effect of target test on overall operation of machinery plant.

Maximum speed would have been reduced to about 15 knots temporarily by damage to the boiler casings. This could have been restored to normal within a few hours by the ship's force. The refrigeration plant is inoperable. Extent of damage to it was not determined, but it is believed that damage was not heavy.

### B. Boilers.

The boilers were considerably damaged by shock and blast pressure (see below), but the damage would not prevent

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continued steaming. There would probably have been flarebacks if the boilers had been steaming. #3 boiler was lighted off and 150# steam pressure raised after Test B.

(a) Air casings.

#1 Boiler: - The outboard lower casing was pushed out about 3 inches, parting from the upper casing at the toggle bolt joint. The front casing was bulged out about 1 inch.

#2 Boiler: - The outboard lower casing was pushed out about 3 inches, parting from the upper casing at the toggle bolt joint.

#3 Boiler: - Same as #2, also inspection plate knocked off.

#4 Boiler: - Both outboard and inboard lower casings were bulged out about 3 inches, and parted from the upper casings at the toggle bolt joints. See photograph 1934-7, page .

#5 Boiler: - No appreciable damage to boiler casings.

#6 Boiler: - Both outboard and inboard lower casings were bulged out about 3 inches and parted from the upper casings at the toggle bolt joints. A small inspection plate on the front casing was blown off.

The damage to boiler casings was such that operation of the boilers could have continued but with reduced efficiency. The damaged casings would have permitted some air leakage which would have prevented steaming at high rates. Temporary repairs to casings could have been effected without shutting down the boilers so that full steaming capacity would have been available in 3 to 4 hours. Repairs of a permanent nature could have been effected by the ship's force in about a day.

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(b) External fittings.

No damage.

(c) Fuel oil burner assemblies.

No damage.

(d) Brickwork and furnaces.

#1 Boiler: - The back wall had a number of cracks extending down about 3 feet below the peak. Plastic insulation at the peak fell out.

(e) Steam, water drums, and headers.

No damage.

(f) Tubes.

No damage.

(g) Foundations.

No. 2 Boiler - The paint around the foundation bolts was cracked, indicating slight motion. The bolts were not loosened.

No. 5 Boiler - The boiler appeared to have moved about 1/32 inch at the forward inboard sliding foot, as evidenced by cracked paint. Photographs 1934-8 and 9, pages , and .

(h) Stacks and uptakes.

No damage.

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C. Blowers, Forced Draft.

There was no apparent damage to the forced draft blowers, all of which have been turned freely by hand after Test B.

D. Fuel Oil Equipment.

No apparent damage.

E. Boiler Feedwater Equipment.

No apparent damage.

F. Main Engines.

There was no apparent damage to the main engines. Disturbance of dust and paint at the foundation indicates slight vertical movement of #2 low pressure turbine (port side). It is not believed that the turbines would have been damaged if they had been in operation. Leads left in bearings of the main engines were not removed after Test B because of radiological hazard.

G. Reduction Gears.

No apparent damage.

H. Shafting and Bearings.

There was no apparent damage to the shafting and bearings. No. 4 shaft alley was completely flooded by water leaking from the part of the ship damaged at Okinawa, but this would not have prevented operation.

I. Lubrication System.

No apparent damage.

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J. Condensers and Air Ejectors.

There was no apparent damage to the condensers and air ejectors. No. 3 main condensers had the injection and overboard valves open during the Test.

K. Pumps.

No apparent damage.

L. Auxiliary Generators (Turbine and Gears).

No apparent damage.

M. Propellers.

The propellers have not been inspected since Test B. There is no reason to believe that they were damaged.

N. Distilling Plant.

No apparent damage.

O. Refrigeration Plant.

The refrigerating plant could not be inspected as the space containing it was full of freon gas and could not be ventilated because of considerations of radiological safety. Apparently there was considerable leakage or breakage of freon lines.

P. Winches, Windlasses, and Capstans.

There is no apparent damage to equipment included in this item. The two forward warping winches have been operated satisfactorily by power since Test B.

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Q. Steering Engine.

There is no apparent damage to the steering engine. The electric steering equipment was not inspected. This space was flooded by war damage and was still flooded during Test B.

R. Ammunition Hoists, Etc.

No apparent damage.

S. Ventilation (Machinery).

No apparent damage.

T. Air Compressors.

No apparent damage.

U. Diesels (Generators and Boats).

There was no apparent damage to the diesel generators. The forward diesel generator has been operated satisfactorily since Test B.

V. Piping.

There was no apparent damage to piping except for two gages on which the pointers had jumped past the stop pins. One of these is a fuel oil service gage in #3 fire room, the other is an auxiliary steam gage in #1 fire room.

W. Miscellaneous.

(a) Messing machinery.

No apparent damage.

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(b) Messing equipment.

No apparent damage.

(c) Laundry equipment.

No apparent damage.

(d) Machine shop.

One holding down bolt of the milling machine was broken but this does not appear to affect operability of the machine.

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## TECHNICAL INSPECTION REPORT

### SECTION III - ELECTRICAL

#### GENERAL SUMMARY OF ELECTRICAL DAMAGE

##### I. Target Condition After Test.

- (a) Drafts after test; list; general areas of flooding, sources.

Drafts - not observed.

List - not observed.

Flooding - water entering from rudder head and patch over 1945 torpedo damage, progressively flooded several compartments aft. Spaces affected are listed in Hull Staff Report and Commanding Officer's Report.

- (b) Structural damage.

Minor damage to already damaged and weakened structure in vicinity of 1945 torpedo damage, had little or no effect on electrical equipment except for flooding.

- (c) Damage: Electrical, ship control, fire control and gunnery.

Damage to electrical machinery and electrical elements of ship control, fire control and gunnery as a direct result of the bomb was apparently negligible.

A small amount of mercury was spilled from the forward master gyro compass and several selectors, connectors and dust shields were dislodged on the automatic telephone exchange switchboard.

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## II. Forces Evidenced and Effects Noted.

### (a) Heat.

None evidenced.

### (b) Fires and explosions.

None evidenced.

### (c) Shock.

There was some evidence of shock throughout the vessel. However, except for minor damage to master gyro compass, automatic telephone switchboard and a few marine globes broken, electrical equipment was unaffected.

### (d) Pressure.

This vessel was subjected to a pressure wave sufficient to cause further bulging of boiler casings and minor damage to a few radar antennas. However, there was no damage to any of the electrical equipment that could be detected from close visual examination.

### (e) Any effects apparently peculiar to the atom bomb.

Radioactivity and wave phenomena.

## III. Effects of Damage.

### (a) Effect on electrical equipment and ship control.

The overall effect on the electrical installation was negligible. The main electrical plant, switchboards, distribution panels, boiler and engine room motor driven auxiliaries were undamaged and apparently operable.

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Ship control was affected to the extent of the minor damage to master gyro compass and secondary damage to the electric steering gear due to flooding of compartment D-421 port and D-421 starboard. This flooding was due to failure of temporary patch over torpedo damage which occurred in 1945 at which time this equipment was rendered inoperable.

(b) Effect on gunnery and fire control.

The electrical elements associated with gunnery and fire control were impaired to the extent of the minor damage to master gyro compass which had sufficient loss of mercury to introduce an error into the fire control input.

The power panels on electric deck in turret I and III, training motor in 40mm mount number 7 and elevating motor in 40mm mount number 2 received secondary damage from flooding, which was apparently due to decontamination efforts, while washing down with salt water.

(c) Effect on watertight integrity and stability.

Electrical damage had no adverse effects on watertight integrity and stability.

(d) Effect on personnel and habitability.

Other than the effects of radioactivity it is estimated that casualties on topside would have been limited to minor bruises. Personnel below decks would be relatively secure except in firerooms where possible flareback and accumulation of combustion gases would render all operating personnel casualties, at least temporarily.

Habitability has not been impaired as a result of any electrical damage.

(e) Total effect on fighting efficiency.

The fighting efficiency of this vessel has been somewhat

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reduced due to minor damage to master gyro compass which had sufficient loss of mercury to introduce an error to the inputs of radar and fire control equipment.

**IV. General Summary of Observers's Impressions and Conclusions.**

(a) This vessel was subjected to an underwater shock wave of sufficient intensity to cause minor damage to master gyro compass and automatic telephone exchange switchboard. There was no other electrical damage except for flooding of electric steering gear room (which could have been controlled had a crew been on board) and a broken dome door glass on the starboard 36" inch searchlight which was apparently struck by a fragment.

**V. Recommendations.**

None.

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## DETAILED DESCRIPTION OF ELECTRICAL DAMAGE

### A. General Description of Electrical Damage.

#### (a) Overall condition.

The main and emergency generating plant, distribution switchboards, power and lighting distribution panels, boiler and engine room motor driven auxiliaries from close visual inspection appeared undamaged and operable.

The electrical elements of ship control, fire control and communications were unaffected except for minor damage to master gyro compass and automatic telephone exchange switchboard, all of which was within the capacity of the ship's force to repair in a relatively short time.

The electric steering gear was rendered inoperable from secondary damage due to progressive flooding in this area. This flooding was due to failure of temporary patch over 1945 torpedo damage, at which time this equipment was rendered inoperable.

#### (b) Areas of major damage.

There was no areas of major damage, minor damage occurred in vicinity of central station and electric steering gear room.

#### (c) Primary causes of damage in each area of major damage.

Underwater shock.

#### (d) Effect of target test on overall operation of electric plant.

##### 1. Ships service generator plant.

Apparently undamaged and operable.

##### 2. Engine and boiler auxiliaries.

Apparently undamaged and operable.

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3. Electrical propulsion.

Not applicable.

4. Communications.

Apparently undamaged and operable, except for minor damage to master gyro compass and automatic telephone exchange switchboard as a direct result of underwater shock.

5. Fire control circuit.

Apparently undamaged and operable except for minor damage to master gyro compass and broken dome door glass in starboard 36" inch searchlight.

6. Ventilation.

Undamaged, however, they could not be operated due to contamination by radioactive dust in trunk lines.

7. Lighting.

Undamaged, except for a few marine globes which were broken throughout ship.

(e) Types of equipment most affected.

Master gyro compass and automatic telephone exchange switchboard.

B. Electric Propulsion Rotating Equipment.

Not applicable.

C. Electric Propulsion Control Equipment.

Not applicable.

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D. Ship's Service Generators.

Apparently undamaged and operable.

E. Emergency Generators.

Undamaged and operated satisfactory.

F. Switchboards and Distribution Panels.

Undamaged and operable except for secondary damage from flooding, which rendered the power supply panels on electric deck in turrets I and III inoperable. This damage was apparently due to decontamination attempts while washing down with salt water.

G. Wiring, Wiring Equipment and Wireways.

Undamaged.

H. Transformers.

Undamaged.

I. Submarine Propelling Batteries.

Not applicable.

J. Portable Batteries.

Undamaged.

K. Motors, Motor-Generator Sets and Motor Controllers.

(a) Rotating equipment.

Undamaged and operable except for secondary damage from flooding rendered the elevating motor in 40mm mount number 2 and training motor in 40mm mount number 7 inoperable. This damage was apparently due to decontamination attempts while washing down

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with salt water and remaining idle over a period of time.

(b) Control equipment.

Apparently undamaged and operable.

L. Lighting Equipment.

Undamaged except for a few lamp globes which were broken throughout the ship due to underwater shock. These globes were apparently not properly secured prior to test.

M. Searchlights.

The front dome door glass on the starboard 36" inch searchlight was broken. This damage was apparently due to a flying fragment.

N. Degaussing Equipment.

Undamaged.

O. Gyro Compass Equipment.

(a) master.

Some mercury was spilled from the Arma Mark 8, Mod 3 forward master gyro, due to underwater shock. From visual inspection no other damage was apparent.

The after master gyro was removed prior to test A.

P. Sound Powered Telephones.

Undamaged.

Q. Ship's Service Telephones.

(a) This vessel is equipped with an obsolete 200 line

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automatic electric company "PAX" telephone system which received the following damage due to underwater shock:

One cabinet door jarred onto the deck.

Three dust shields jarred off switches.

Approximately five selector and nine connectors were dislodged from their racks, all of which were prevented from falling by the cabinet doors. They were not damaged and needed only to be replaced to restore normal operation.

(b) The new design exchange board has provided a means for locking the dust covers and switches in position, preventing similar damage.

R. Announcing Systems.

Apparently undamaged and operable.

S. Telegraphs.

Apparently undamaged and operable.

T. Indicating Systems.

Apparently undamaged and operable.

U. I.C. and A.C.O. Switchboards.

Apparently undamaged and operable.

V. F.C. Switchboards.

Apparently undamaged and operable.

W. Special Materials (Bureau of Ships, Code 660).

Undamaged.

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**SECTION IV**

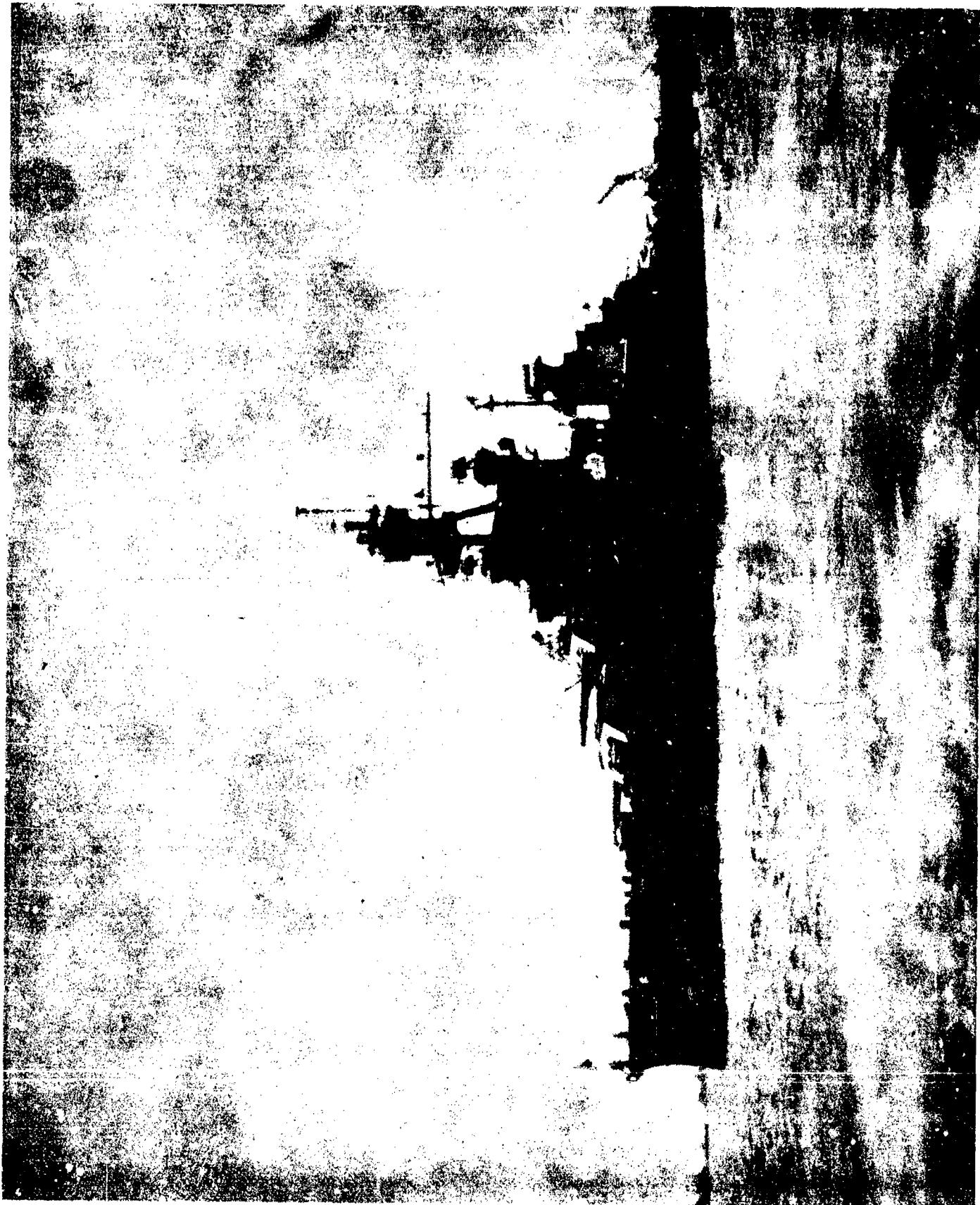
**PHOTOGRAPHS**

**TEST BAKER**

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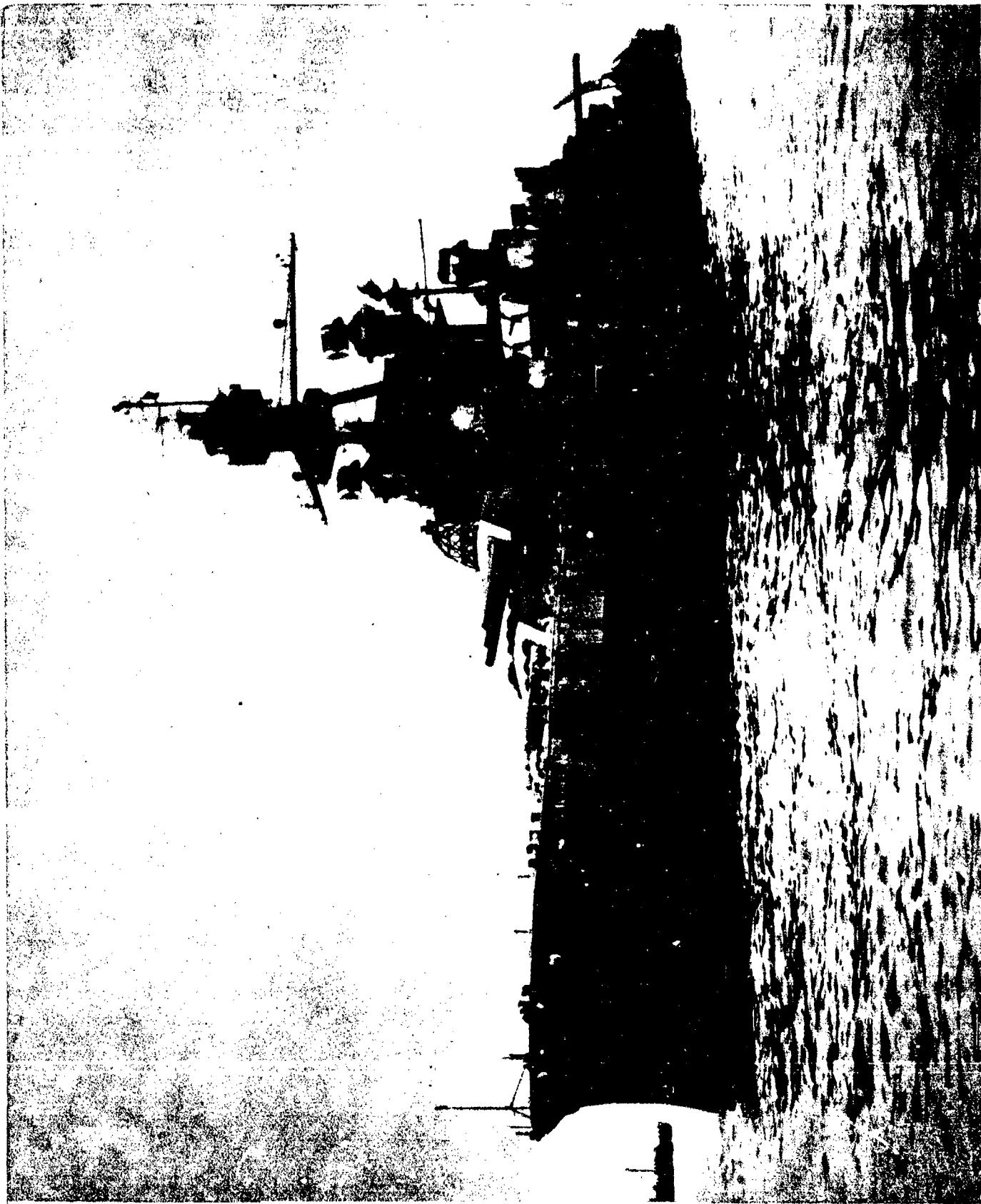


EB-CR-227-520-126. View from off port bow before Test B.

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AB-CR-227-289-36. View from off port bow after Test B.

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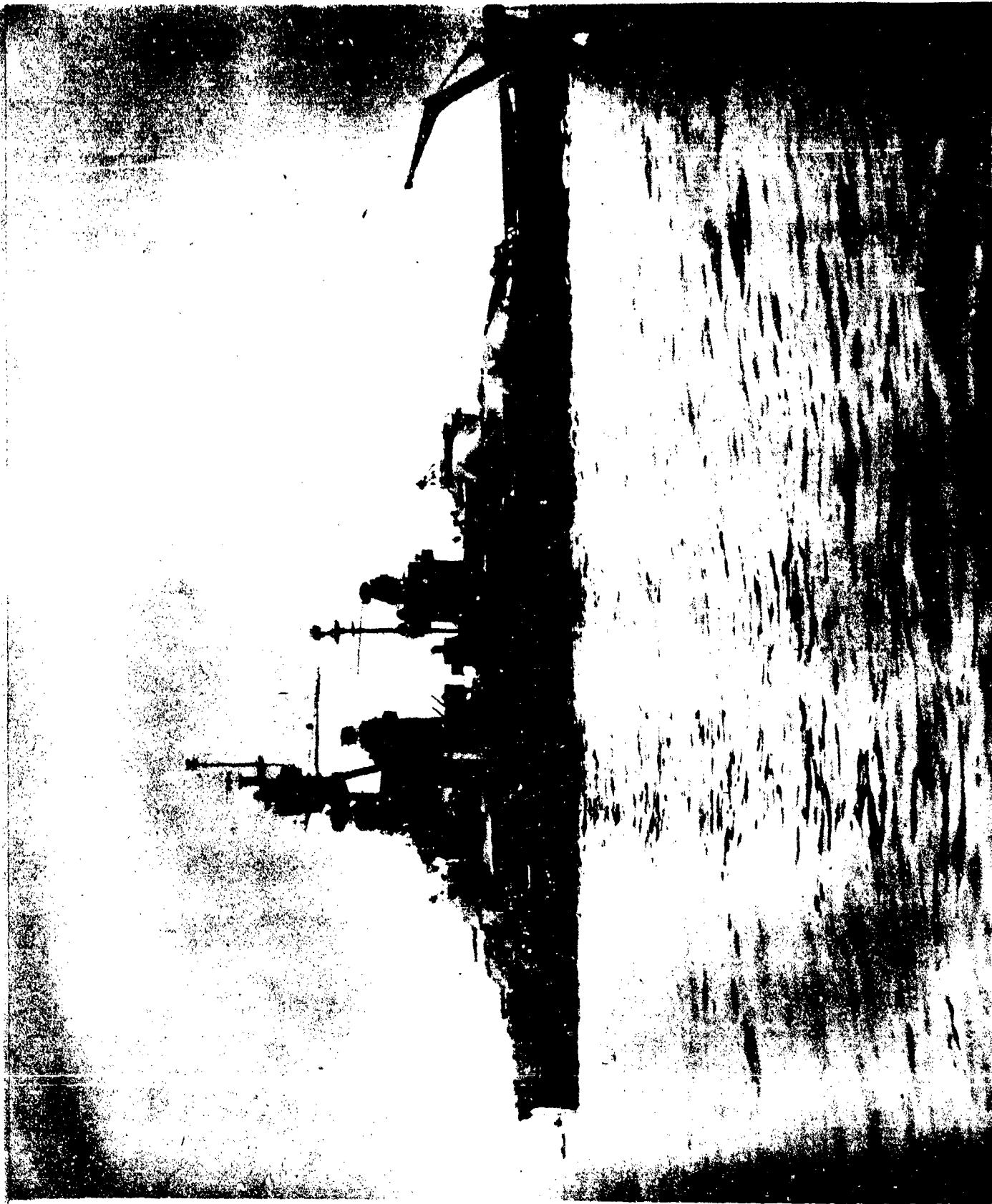
BB-CR-227-520-128. View from off port quarter before Test B.

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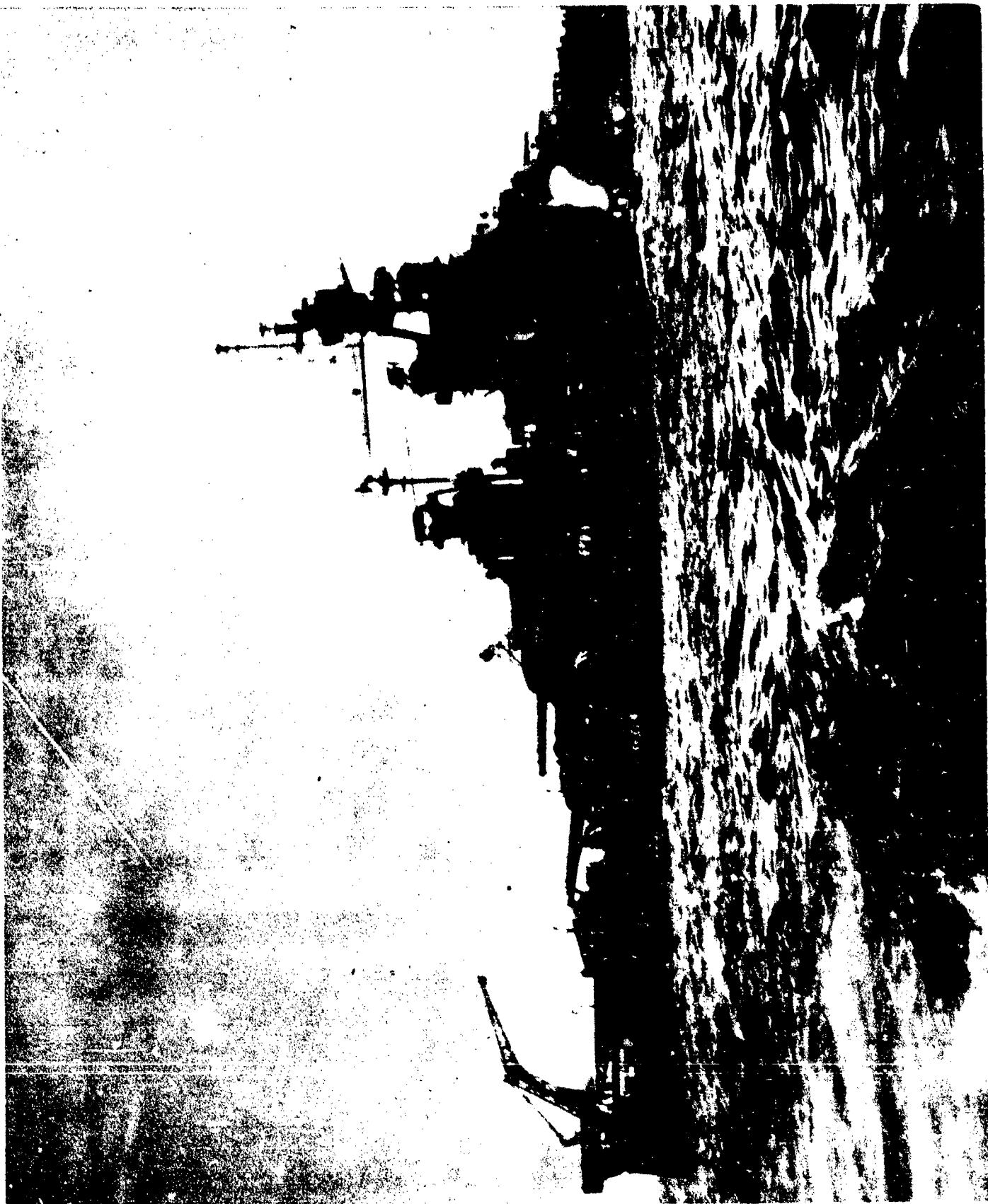
AB-CR-227-289-34. View from off port quarter after Test B.

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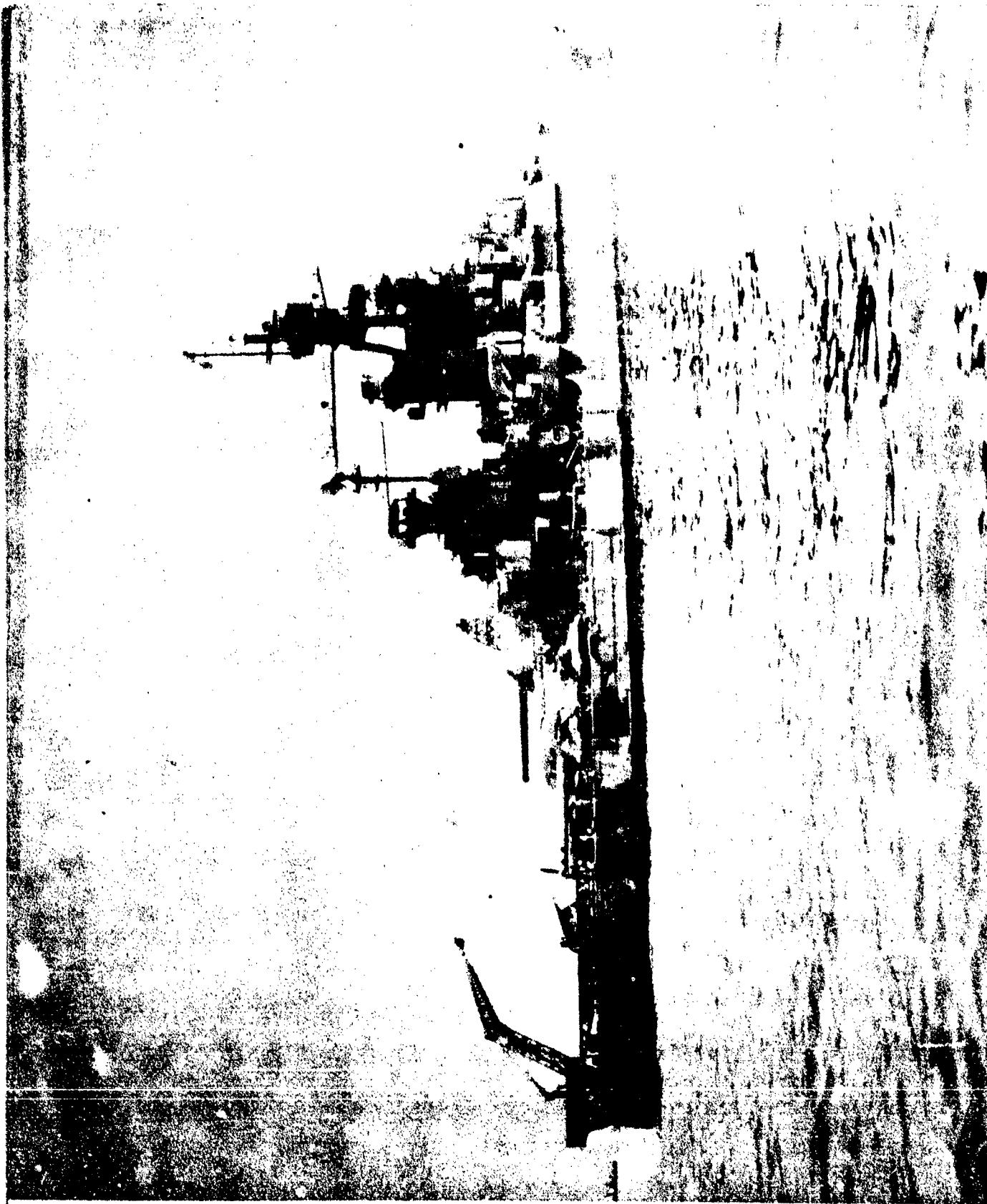
BB-CR-227-520-122. View from off starboard quarter before Test B.

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AB-CR-227-289-40. View from off starboard quarter after Test B.

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BB-CR-227-520-124. View from off starboard bow before Test B.

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AB-CR-227-289-38. View from off starboard bow after Test B.

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BB-CR-76-1934-7. No. 4 boiler (port) outboard side casing.

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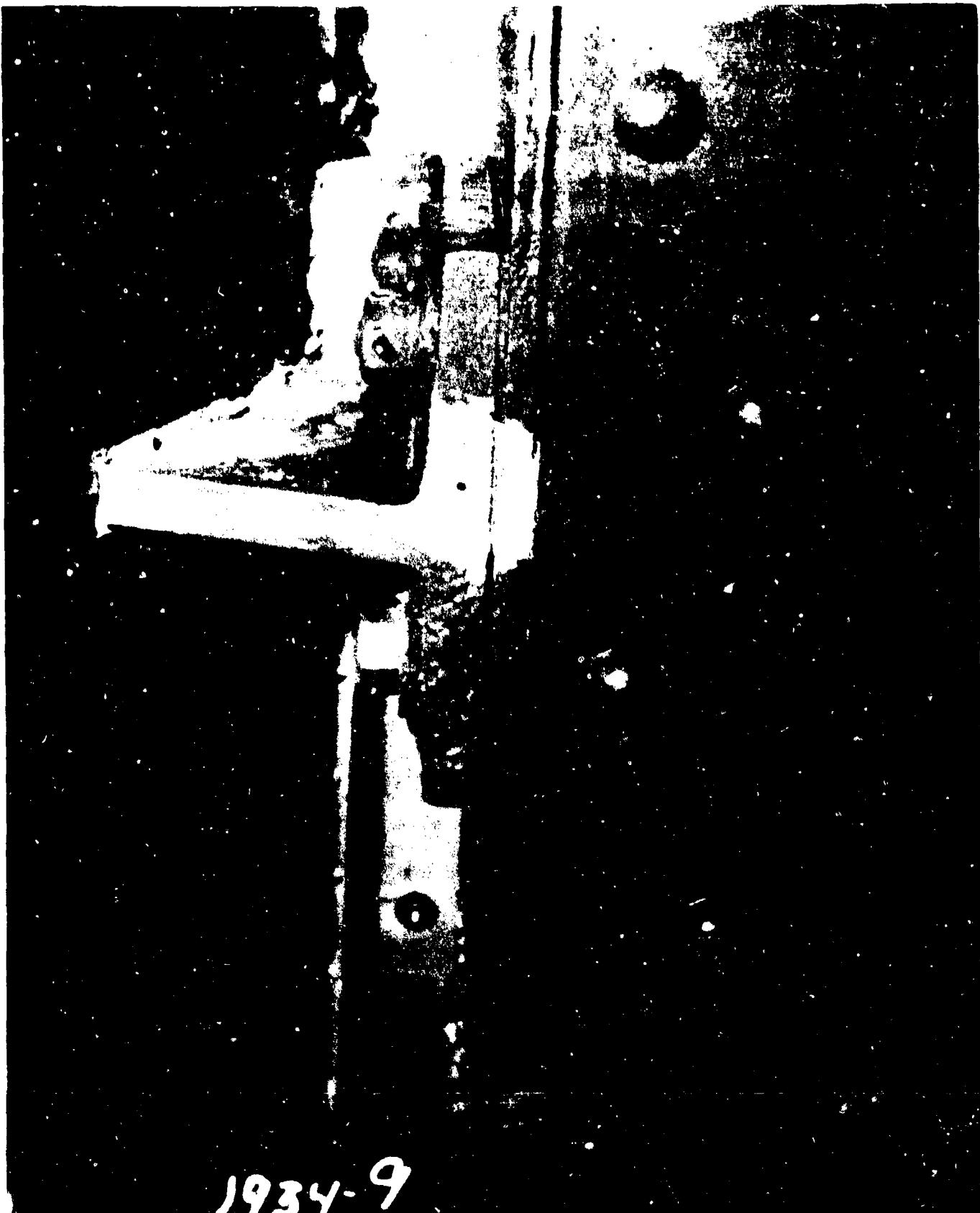
BB-CR-76-1934-8. No. 5 boiler, forward foot.

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1934-9

BB-CR-76-1934-9. No. 5 boiler, center foot.

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**APPENDIX**

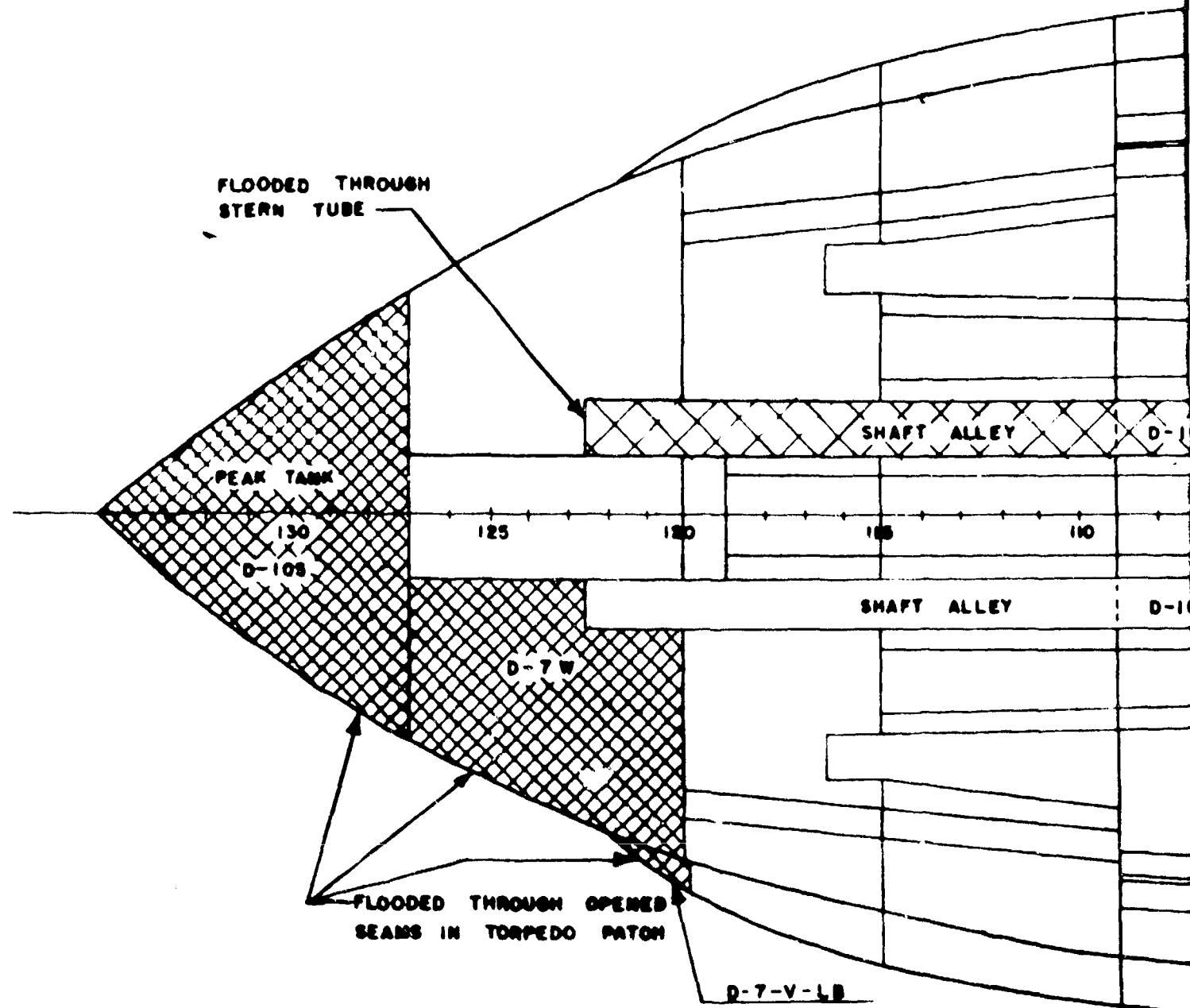
**SHIP FLOODING DIAGRAM**

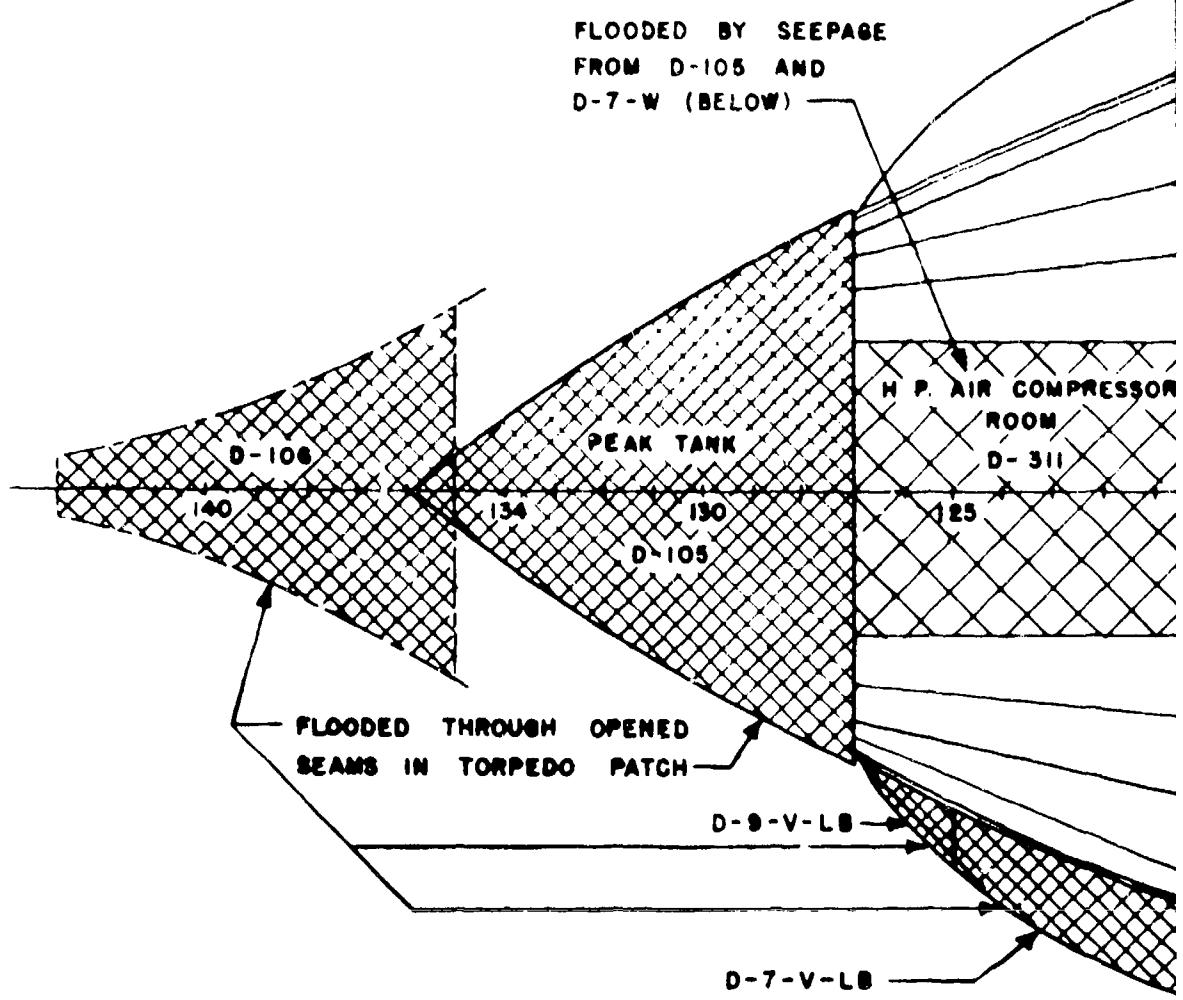
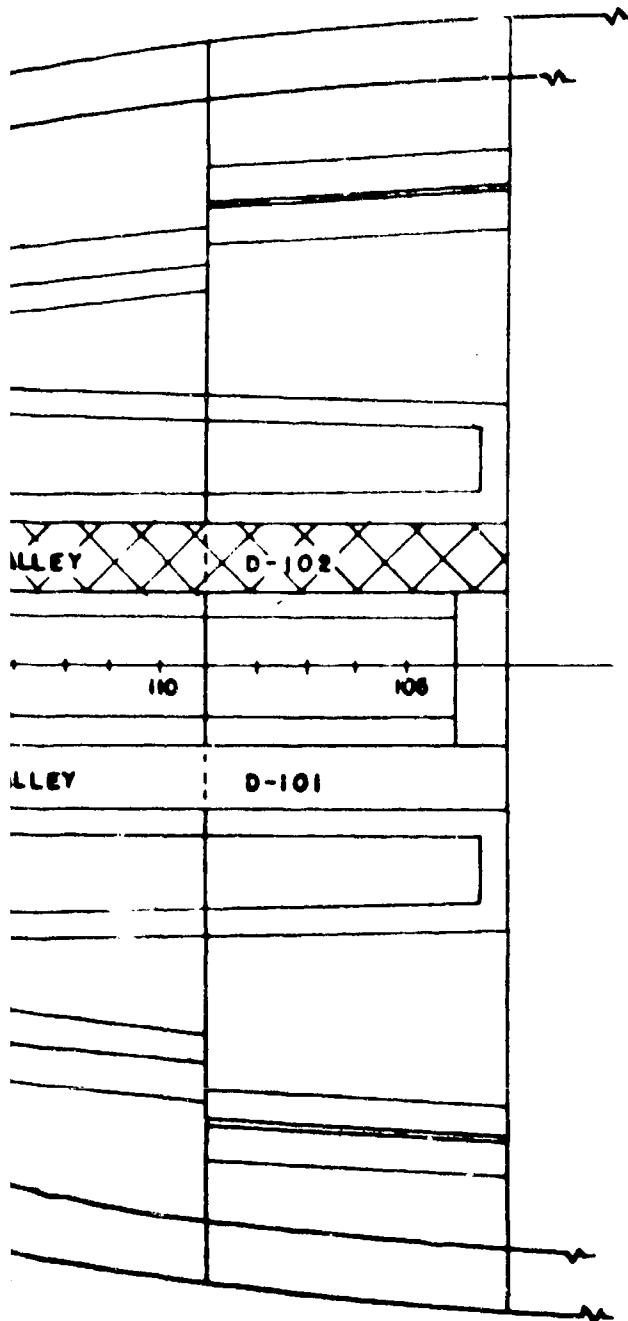
**TEST BAKER**

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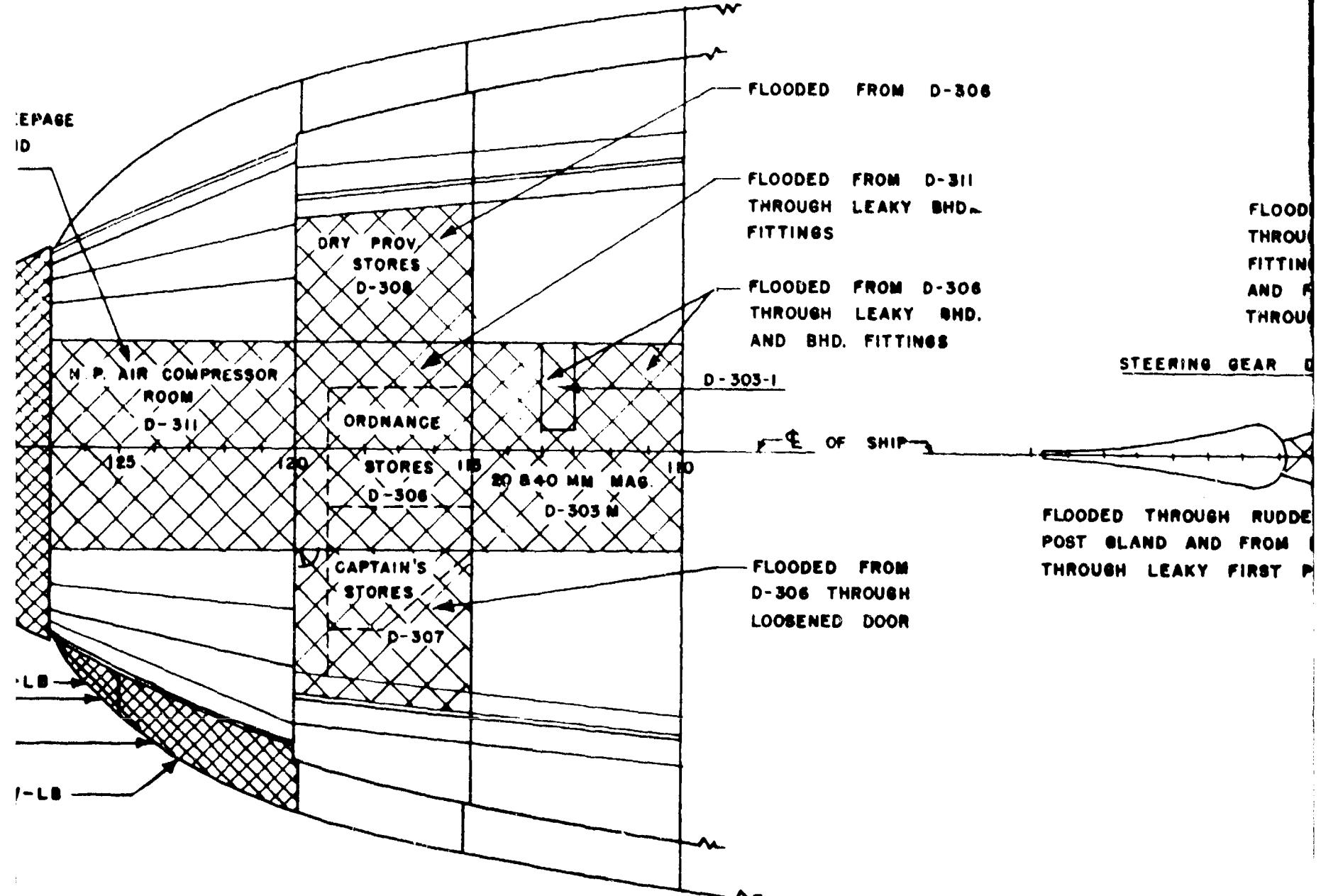




SECOND PLAT

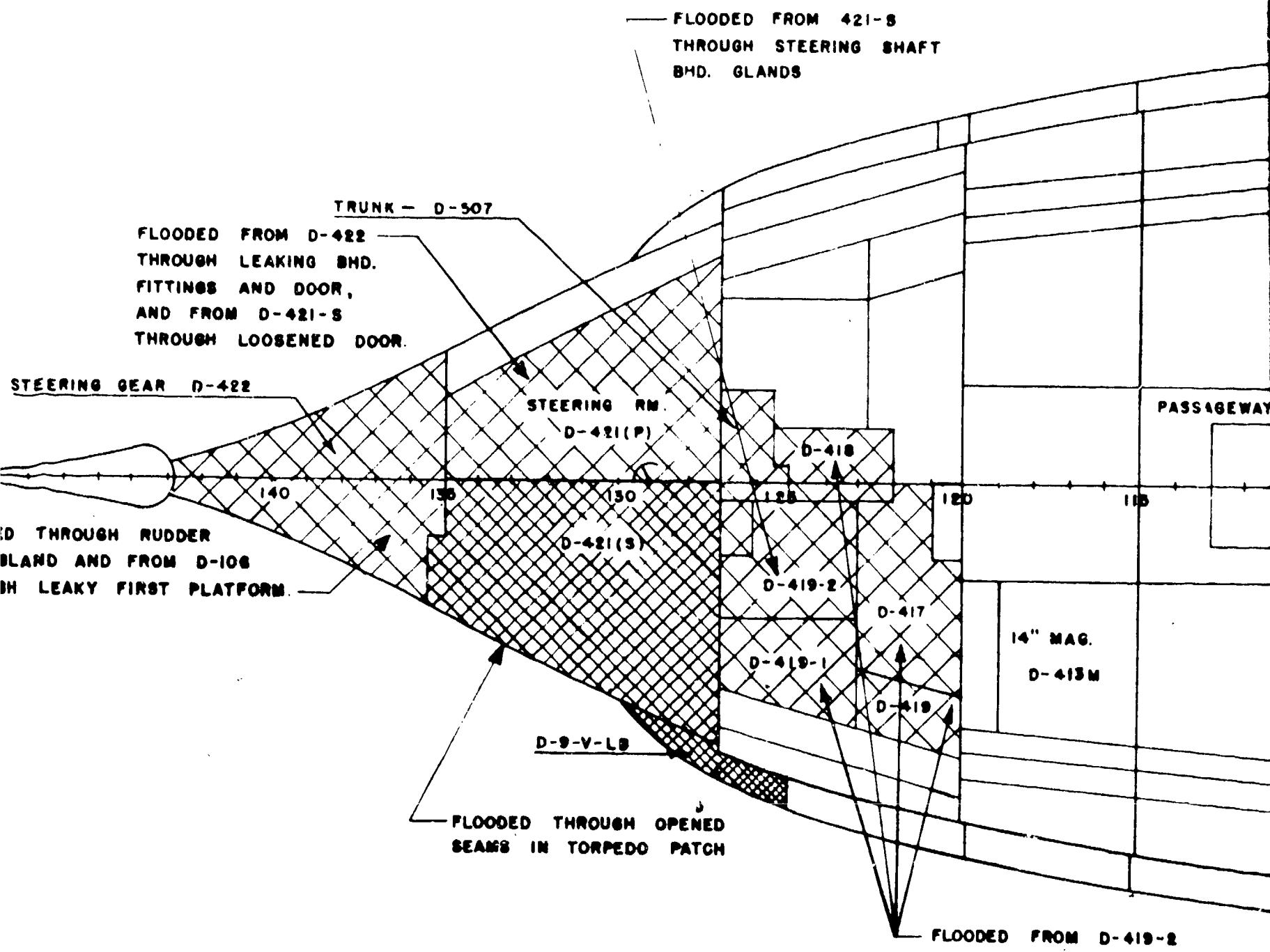
2

EPAGE  
ID



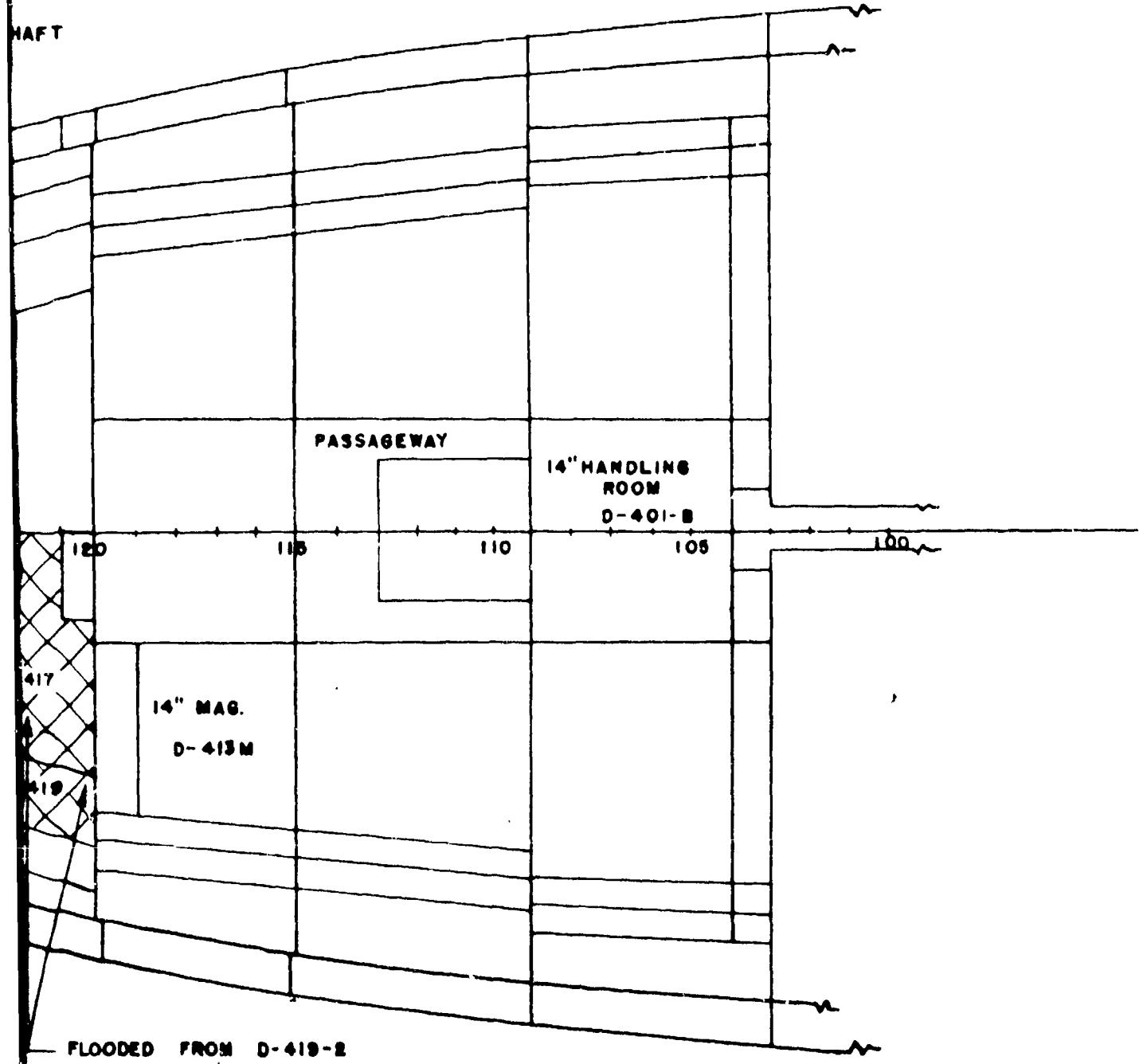
SECOND PLATFORM

3



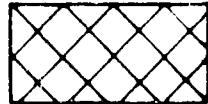
FIRST PLATFORM

HAFT



5

LEGEND



SLOW FLOODING



FAST FLOODING

SECRET

NAVY DEPT.

BUREAU OF SHIPS

6

FLOODING DIAGRAM

TEST B

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**APPENDIX**

**SHIP MEASUREMENT DATA**

**TEST BAKER**

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# DECK DEFLECTION GAGES

SHIP USS PENNSYLVANIA (BB-38)

## TEST B

PR. NO.	DECK	LOCATION	MAXIMUM COMP.	PERMANENT SET		REMARKS
				DIST. OFF &	EXP.	
25.	Main	Port	0-0-1/2	Comp.	None	The gages appeared to have moved up and down three or four times in compression and settled on the zero point.
25	"	Stbd.	0-0-5/16	Comp.	None	
25	"	Stbd.	0-0-3/16	Comp.	None	
40	"	Port	0-0-9/16	Comp.	None	"
40	"	Stbd.	0-0-7/8	Comp.	None	"
69	2nd	Centerline	0-0-3/16	Comp.	None	"
96	"	Port	0-0-3/8	Comp.	None	"
96	"	Stbd.	0-0-1/8	Comp.	None	"
96	"	Stbd.	0-0-3/4	Comp.	None	"
100	"	Centerline	0-0-1/8	Comp.	None	"

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## **DECK DEFLECTION GAGES**

**SHIP** **USS PENNSYLVANIA (BB-38)**

TEST 8

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**APPENDIX**

**COMMANDING OFFICERS REPORT**

**TEST BAKER**

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COMMANDING OFFICERS REPORT

U.S.S. PENNSYLVANIA

REPORT No. 11

A. General Summary.

The first ship's company boarding group reboarded on 8 August. As inspection of the ship progressed the following status was developed.

1. In general all damage above weather decks appeared due to decontamination efforts. Later detailed inspection showed some shock damage.

2. Flooding was progressive from a leak originating between the patch and the hull aft. The exact origin of leakage cannot be determined until the ship is docked and an air pressure can be applied to the interior of the patch. This statement is based upon past experience.

3. The tiller room filled from rudder head leakage which cannot be completely stopped except by drying out this compartment and effecting repairs in such a fashion as to make the rudder inoperative.

4. No other source of leakage has been found.

5. The stern has evidently been severely shaken which has reopened former slow leaks in bulkheads and decks forward of the damaged area.

6. No damage to the outer hull, screws, and rudder was found by inspecting divers. There was evidence of shock, ranging from heavy to light, throughout the ship. The roll of the ship was determined to have been 2-1/2°.

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B. Material Condition after Test.

1. Flooding - The draft upon evacuating the ship on Baker minus one was as follows: Forward 30' Aft. 32' Mean 31'. Upon reboarding on 8 August the draft was taken as follows: Forward 27' 9", Aft. 36', Mean 31' 10" with a one half degree list to starboard. The following compartments were completely flooded: D-102, D-7-W, D-105, D-311, D-106, D-419-2, D-421-S, D-422, D-425, D-425-B, D-9-V-LV, and D-7-V-LV. The following compartments were partially flooded: D-303-M, D-401-V, D-417, D-419, D-419-1, D-407-T, D-421-P, and the trunk over #3 shaft alley. It is believed that the progress of the flooding was as follows: D-422 (Steering gear room) flooded due to leakage from the rudderhead; D-106 flooded from leakage from both the patch area and the rudder head; D-105, D-421-S, D-425, D-9-V-LV, D-7-V-LV, and D-7-W, flooded from seams in the patch. The flooding progressed to D-417, D-421-V, D-311, D-407-T, D-419-2, D-419-1 and D-419 via doors sprung from the shock of blast, steering shaft packing and leaky deck fittings. D-303-M was probably flooded from D-417 through the gear case on the steering shaft, and from that space to D-102 via holes in the deck. The seepage in the #3 and #4 engine rooms was probably from the shaft alleys.

2. Other Damage - There seemed to be a concentration of shock on the second deck between frame 90 and 113. In this area curtains were blown off hangers, dishes broken in the wardroom pantry, damage control plates on the bulkhead of the port officers passageway bounced from rack, and emergency handy-billy hoses that also bounced from the rack at frame 90, steam tight bulbs were broken. In the machine shop three foundation bolts were broken, the milling machine had moved to starboard, and the foundation bolts on the boring mill were found to be loose. The cruising turbine in #1 engine room moved slightly on its foundation as evidenced by cracked paint. In the engineering spaces other evidences of shock were noticed, but in no case did it appear great enough to render the machinery inoperable.

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3. Superstructure - No damage to the superstructure as a result of the blast was noticed.

4. Interior - See above.

5. Turrets, guns, and directors - In general, all ordnance equipment was found to be in the same condition as prior to Test B, disregarding the effects of decontamination attempts by washing down, except as noted below. There were evidences of shock inside the turrets. The periscope in turret I was bounced from the bulkhead bracket stowage. The telephone receivers were dislodged and one bag of test powder was knocked from the tray on the lower 14" /45 hoist to the deck of the handling room. The power panels on the electric deck of turrets I and III were shorted out, apparently due to flooding from washing down procedures. The train securing pins in the Mk 38 directors, both port and starboard were frozen and could not be removed. The starboard Mk 37 showed a horizontal shift in a forward direction, causing binding of radial bearings at 090°, 120°, 150°, and 180°. The power motors on Quad 7 could not be started, and the elevation motor on Quad 2 burned out after testing satisfactorily in local. This was apparently due to salt water from washing down.

6. Ammunition - All ammunition was apparently undamaged.

7. Boilers.

#1 Boiler.

The boiler air casing access panels were found with toggle bolts slipped out and panel gaskets blown out of various places on both the inboard and outboard sides. Front walls bulged out to a maximum of one inch tapering from outward toward the center. The interior of the fire box wall plastic peak collapsed. There were various small cracks throughout the entire wall, all other brickwork remaining intact. No hydrostatic tests have been applied to this boiler since Baker day.

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**#2 Boiler.**

The boiler casing was found intact with the exception of bulges in the front wall to a maximum of 3/4 inch tapering from outward towards center burner. This boiler was steaming up to a hundred and fifty pound P.S.I. after the Baker test on natural draft and found satisfactory except as noted. No hydrostatic test applied.

**#3, #4, #6 Boilers.**

The air casings were bulged out to a maximum of 4 inches on both the outboard and inboard sides. Panels above the access panels were blown completely out. Brick work was found intact with the exception of slag which was torn loose.

**#5 Boiler.**

Air casings were intact and no damage was noticed to the brickwork. Sliding feet moved a maximum one and one eighth inch on the after end thus twisting the foundation slightly. No hydrostatic test applied. All piping in the vicinity of fire room was found to be intact except one branch of the fire main in #2 fire room which has sprung a slight leak at the sweated joint directly above the floor plate.

**8. Electronics.**

**(a) Summary of damage.**

The damage to electronic equipment aboard this ship was light, and caused mainly by shock. The few equipments which did not operate properly at first were found to have either tube damage or some of the sliding units forced out of the main frame, thus opening interlocks. The two main instances of tube damage were: The SK, in which all 4 transmitter oscillator glass tubes were shattered; and the starboard Mk 29, in which the glass of the 829 tube in the modulator was cracked at #4 pin. The

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antennas were damaged. The two Mk 12 antennas on Mk 37 directors have been twisted to the side about 10°. The aft port Mk 28 Md 2 has had its dipole assembly on the parabola broken off. Antennas and all exposed surfaces of the various units have been subjected to decontamination methods, and show the effects of the many applications. Due to the limited tolerance on the ship it was impossible to make detailed inspections and tests such as was done after Test Able. However, there has been no damage evident that would not have been caused by any very great shock.

(b) Fire Control Radar.

1. Mk 8 - OPERATING INTO DUMMY LOAD ON BAKER DAY.

2. Mk 10 - No damage. Operation normal.

3. Mk 12 Port - Antenna assembly bent sideways. Transmitter frequency normal. Magnetron current and power output low. Probably needs new magnetron.

4. Mk 12 Stbd. - Antenna assembly bent sideways. When power first applied to unit, transmitter would not operate due to RCVR panel having been forced open, thus opening up an interlock. Corrected. Transmitter frequency and power output normal.

5. Mk 22 Port - Antenna assembly bent. Two fuses open, otherwise operation normal.

6. Mk 22 Stbd. - Antenna assembly bent. No transmitter current or power output. Modulator trouble.

7. Mk 28 Md 2 Fwd. Port - OPERATING IN STANDBY ON BAKER DAY. No damage. Transmitter frequency and power output normal.

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8. MK 28 Md 2 Fwd. Stbd. - OPERATING INTO TS-74/ UPM DUMMY LOAD ON BAKER DAY. No damage. Transmitter frequency and power output normal. Time meter on this equipment indicated that the set operated until 1300 on Baker day, when the diesel-alternator probably ran out of fuel.

9. Mk 28 Md Aft Port - Dipole assembly on parabola broken off. Operation at indicator normal.

10. Mk 28 Md 2 Aft Stbd. - No damage. Transmitter frequency and power output normal.

11. MK 28 Md 3 Spot 1 - No damage, operation normal.

12. Mk 29 Md 2 Port - No damage other than that caused by Test Able.

13. Mk 29 Md 2 Stbd - OPERATING INTO DUMMY LOAD ON BAKER DAY. When power first put on this unit there was no magnetron current or power output. Found 829-B tube in modulator with glass cracked at pin #4. Replaced tube, resulting operation normal.

(c) Surface Search Radar.

1. SG - OPERATING INTO DUMMY LOAD ON BAKER DAY - Resistor R-102 in HV rectifier circuit open. No spares available so could not replace.

2. SQ - Unit intact. - Three support legs knocked out of place. Interior of unit watersoaked. Power not applied to equipment.

(d) Air Search Radar.

1. SK - Transmitter inoperative. All four 327 A oscillator tubes shattered by force of blast. Grid coils broken off. Insulator for supporting plate supply disc broken in all

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four supporting positions. Plate shorting device jammed on shorting position. Indicator operative. Top row of unit sections all knocked loose and slid out from indicator, but undamaged.

2. SP - OPERATING IN STANDBY ON BAKER DAY -  
No damage.

(e) Radar Repeaters - All intact and undamaged. VF in CIC - spot on B-scope moveable only 1000 yds instead 2000 yds.

(f) RCM Equipment - All intact. Power not put on units.

(g) IFF Equipment - All intact. Power not put on units. Mk 32 indicator on port Mk 12 knocked partly out of case.

(h) Communication Transmitters - All intact and undamaged, except TDE-2 will not key.

(i) Communication Receivers - All intact and undamaged except, 2 - RBH and 1 RBS, in Flag Radio were wrenched loose from bulkhead. Units watersoaked and corroded.

(j) Communication Antenna - Undamaged.

(k) Radio Transceivers - Intact and undamaged.

(l) Fathometer - Intact and undamaged.

(m) Loran Equipment - OPERATING DURING BAKER DAY  
Inoperable - water soaked and corroded.

(n) Test Equipment - All undamaged except - LR-2 frequency meter in Radio 1. Face of HPM frequency meter part of LR-2 blown off but motor operable.

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### C. Radiological Summary.

The average Geiger readings the first day of reboarding by the ship's crew were:

1. Starboard side of the main deck aft from 2.0 to 4.0 R with maximum readings up to 10.0R in and around the water-ways and scuppers.

2. Port side of main deck aft reading about same as starboard side with similar hot spots plus reading as high as 15.0R in the vicinity of the plane.

3. The port and starboard side of the forecastle showed similiar readings of between 1.5 to 3.0R with hot spots in and around the waterways. The hottest spot with a reading of 18.0R was the stopped up scupper on the port side near the slop chute at frame 53.

4. The readings on the superstructure deck were generally higher than those on the other weather decks, giving an average of between 2.0 and 4.0R, hotter spots being in and around the vegetable locker and other places where water had accumulated.

5. The mainmast gave an average reading of about 1.5R while those of the foremast were slightly higher.

6. No information is available to the commanding officer relative to Geiger readings which were taken prior to boarding. Therefore no discussion as to the effect of radio-activity on personnel is submitted.

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D. Conclusions.

As was well known prior to the test, the value of this ship as a target for an underwater blast was questionable due to the weakened condition of the hull as a result of the patch that covered wartime torpedo damage. The efforts to make the patch watertight were makeshift and were not successful until the ship was docked at Pearl Harbor after vibration while steaming from Puget Sound to San Pedro and thence to Pearl had opened welded seam. The normal rudderhead leakage prior to test Baker was sufficient to allow 14" of water in to the tiller room during the short time that the ship was evacuated for Able day. This leakage is the source which filled the tiller room and was partly responsible for partial flooding of D-421 port. It is considered that the leakage from the after end of the patch where it extended over the armor plate to meet the hull was the source of supply that caused progressive flooding into the other spaces. Had the preparation of the ship for the tests included removal of the patch and replacement of the shell plating it is believed that flooding would have been confined to the tiller room with seepage of a very small amount of water into D-421 port.

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**Defense Special Weapons Agency**  
6801 Telegraph Road  
Alexandria, Virginia 22310-3398

TRC

18 April 1997

MEMORANDUM FOR DEFENSE TECHNICAL INFORMATION CENTER  
ATTENTION: OMI/Mr. William Bush (Security)

SUBJECT: Declassification of Reports

The Defense Special Weapons Agency has declassified the following reports:

/ ✓ AD-366588 L	XRD-203-Section 12 ✓
AD-366589 L	XRD-200-Section 9
AD-366590 L	XRD-204-Section 13
AD-366591 L	XRD-183
/ ✓ AD-366586 X	XRD-201-Section 10 ✓
/ ✓ AD-367487 X	XRD-131-Volume 2-
/ ✓ AD-367516 X	XRD-143 ✓
/ ✓ AD-367493 X	XRD-142 ✓
AD-801410L ✓	XRD-138 ✓
AD-376831L ✓	XRD-83 ✓
AD-366759 L	XRD-80
/ ✓ AD-376830L X	XRD-79 ✓
/ ✓ AD-376828L X	XRD-76 ✓
/ ✓ AD-367464 X	XRD-106 ✓
AD-801404L ✓	XRD-105-Volume 1 ✓
/ ✓ AD-367459 X	XRD-100 ✓

TRC

18 April 1997

Subject: Declassification of Report

AD-376836L✓	XRD-98✓
AD-376835L✓	XRD-97✓
AD-376834L✓	XRD-96✓
AD-376833L✓	XRD-95✓
✗ AD-376832L✓	XRD-94✓ re-ingest
✓✓ AD-367458✗	XRD-93✓
AD-367457✓	XRD-92-Volume 2✓
AD-367456✓	XRD-91-Volume 1✓
AD-367455✓	XRD-90✓
AD-367454✓	XRD-89✓
AD-367453✓	XRD-88✓
AD-367452✓	XRD-87✓
AD-366764✓	XRD-86
AD-376837L✓	XRD-99
AD-366758✓	XRD-78
AD-366734✓	XRD-44
AD-366763✓	XRD-85✓
AD-376829L✓	XRD-77✓
✓✓ AD-367462✗	XRD-103✓
✓✓ AD-367463✗	XRD-104✓
✓✓ AD-367461✗	XRD-102✓
AD-367460✓	XRD-101✓

TRC

18 April 1997

Subject: Declassification of Reports

AD-801406L ✓ XRD-114:

In addition, all of the cited reports are now **approved for public release; distribution statement "A" now applies.**

*Ardith Jarrett*  
ARDITH JARRETT  
Chief, Technical Resource Center